MOD TOOL (MICROWAVE OPTICS DESIGN TOOL)

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The Jet Propulsion Laboratory (JPL) is currently designing and building a number of instruments that operate in the microwave and millimeter-wave bands. These include MIRO (Microwave Instrument for the Rosetta Orbiter), MLS (Microwave Limb Sounder), and IMAS (Integrated Multispectral Atmospheric Sounder). These instruments must be designed and built to meet key design criteria (e.g., beamwidth, gain, pointing) obtained from the scientific goals for the instrument. These criteria are frequently functions of the operating environment (both thermal and mechanical). To design and build instruments which meet these criteria, it is essential to be able to model the instrument in its environments.

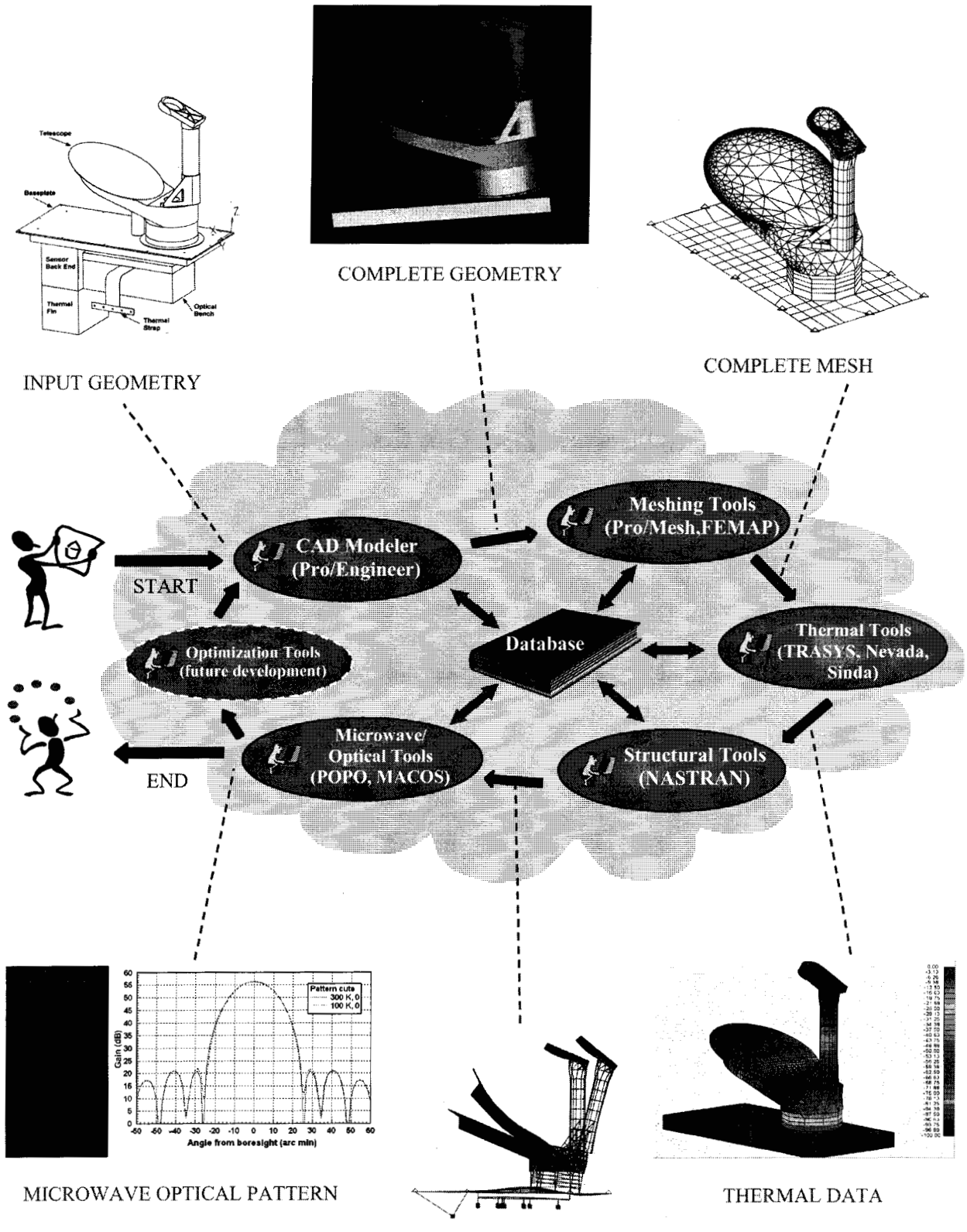
Currently, a number of modeling tools exist. Commonly used tools at JPL include: FEMAP (meshing), NASTRAN (structural modeling), TRASYS and SINDA (thermal modeling), MACOS/IMOS (optical modeling), and POPO (physical optics modeling). Each of these tools is used by an analyst, who models the instrument in one discipline. The analyst then provides the results of this modeling to another analyst, who continues the overall modeling in another discipline.

There is a large reengineering task in place at JPL to automate and speed-up the structural and thermal modeling disciplines, which does not include MOD Tool. The focus of MOD Tool (and of this paper) is in the fields unique to microwave and millimeter-wave instrument design. These include initial design and analysis of the instrument without thermal or structural loads, the automation of the transfer of this design to a high-end CAD tool, and the analysis of the structurally deformed instrument (due to structural and/or thermal loads).

MOD Tool will be a distributed tool, with a database of design information residing on a server, physical optics analysis being performed on a variety of supercomputer platforms, and a GUI residing on the user's desktop computer. Goals for MOD Tool include support of multiple platforms GUIs(PC, Mac, Unix), ease-of-use, time-to-complete of analysis, and automation of data transfer. We are currently using Expectk to build the GUI, and automated ftp and telnet operations to transfer files and launch analysis programs on the supercomputers.

MOD Tool is being built in conjunction with MIRO. The motivation for this is both to help the MIRO project by providing the analyses required in a timely manner as well as to help MOD Tool by providing a real instrument as a test case. Examples of usage of MOD Tool for MIRO, including MIRO results will be presented.

Future needs that MOD Tool is designed to be able to meet include using analysis of a metrology input (the instrument as-built), and design optimization. As MOD Tool develops these capabilities will be added, but they have been considered over the complete MOD Tool development cycle.



Conceptual process to be performed by MOD Tool